

## Characterization and Mutagenicity of Smoke from Smoldering and Flaming Combustion of Peat and Red Oak Biomass Fuels

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Although wildfire smoke is known to cause adverse health effects, less is known about the relative effects of wildfire smoke from different fuel types or combustion conditions. In this study, we describe a novel in-tandem application of controlled combustion and cryo-trapping techniques that utilize an automated tube furnace system to simulate wildfire combustion and facilitates the efficient collection of the resulting smoke emissions. The furnace sustained stable flaming and smoldering biomass (red oak, peat) burning conditions consistently for ~60 min. The multi-stage cryo-trapping system collected up to 90% of the biomass combustion emissions at -70°C. Condensates were extracted and assessed for mutagenicity in *Salmonella* strain TA98+/-S9. Carbon dioxide, carbon monoxide (CO), and particulate matter (PM) concentrations were monitored continuously during the combustion process and used to calculate the modified combustion efficiency (MCE) and emission factors (EFs). We found that the MCE during smoldering conditions was 71% and 74% and during flaming conditions was 96% and 99% for peat and red oak, respectively. Red oak smoldering EFs for CO and PM were 209 g/kg and 147 g/kg, whereas flaming EFs were 16 g/kg and 0.6 g/kg, respectively. Peat smoldering EFs for CO and PM were 301 g/kg and 59 g/kg, respectively, whereas peat flaming EFs were 47 g/kg and 3 g/kg. The ranking of the fuels based on mutagenicity-emission factor in TA98+S9 (revertants x 10<sup>5</sup>/kg fuel) was red oak smoldering (137) > peat smoldering (95) > peat flaming (19) > red oak flaming (2). Our results demonstrate that type of fuel and combustion conditions have dramatic differences in emission characteristics, including pollutant and mutagenicity EFs. The successful application of the novel combustion and sample-collection system presented demonstrates its efficacy for use in future assessments of simulated wildfire emissions. [This abstract does not represent official USEPA policy.]